CLAIMS:

1. A method for introducing a large nucleic acid molecule into a cell, comprising:

(a) exposing the nucleic acid molecule to a delivery agent;

(b) exposing the cell to a delivery agent; and

(c) contacting the cell with the nucleic acid molecule, whereby the nucleic acid molecule is delivered into the cell, wherein steps (a)-(c) are performed sequentially in any order or simultaneously, provided that if the delivery agent is energy it is not applied to the nucleic acid molecule and it is not applied to the cell after contacting the cell with the nucleic acid molecule

2. The method of claim 1, wherein:

the nucleic acid molecule is exposed to an agent that increases contact between the nucleic acid molecule and the cell; and

the cell is exposed to an agent that enhances permeability of the cell.

3. The method of claim 1, wherein the nucleic acid molecule is greater than about 0.6 megabase.

4. The method of claim 1, wherein the nucleic acid molecule is greater than about 1 megabase.

5. The method of claim 1, wherein the nucleic acid molecule is greater than about 5 megabases.

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6. The method of claim 1, wherein the nucleic acid molecule is a natural chromosome, an artificial chromosome, a fragment of a chromosome that is greater than about 0.6 megabase or naked DNA that is greater than about 0.6 megabases.

7. The method of claim 1, wherein the nucleic acid molecule is an artificial chromosome.

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8. The method of claims 1, wherein the nucleic acid molecule is an artificial chromosome expression systems (Aces).

9. The method of claim 1, wherein the nucleic acid molecule is exposed to the delivery agent *in vitro*, *ex vivo* or *in vivo*.

10. The method of claim 1, wherein the contacting of the nucleic acid molecule that has been exposed to the delivery agent with the cell is effected *in vitro*, *ex vivo* or *in vivo*.

11. The method of claim 1, wherein

exposure of the nucleic acid to a delivery agent is effected by mixing the nucleic acid with a delivery agent; and

the exposure of the cell to an agent that enhances permeability comprises applying ultrasound or electrical energy to the cell.

12. The method of claim 1, wherein a delivery agent comprises a cationic compound.

13. The method of claim 12, wherein the cationic compound is selected from the group consisting of a cationic lipid, a cationic polymer, a mixture of cationic lipids, a mixture of cationic polymers, a mixture of a cationic lipid and a cationic polymer, a mixture of a cationic lipid and a neutral lipid, polycationic lipids, non-liposomal forming lipids, activated dendrimers, and a pyridinium chloride surfactant.

14. The method of claim 12, wherein the delivery agent is a composition that comprises one or more cationic compounds, wherein the compound is selected from the group consisting of N-[1-(2,3-dioleyloxy)propyl]-N,N,N-trimethylammonium chloride (DOTMA), dioleoyl-phosphatidylethanolamine (DOPE), 2,3-dioleyloxy-N-[2(spermine-carboxamido)ethyl]-N,N-dimethyl-1-propanaminiumtrifluoroacetate (DOSPA), dioleoyl phosphatidylethanolamine (DOPE), $C_{52}H_{106}N_6O_4 \cdot 4CF_3CO_2H$, $C_{88}H_{178}N_8O_4S_2.4CF_3CO_2H$, $C_{40}H_{84}NO_3P.CF_3CO_2H$, $C_{50}H_{103}N_7O_3.4CF_3CO_2H$, $C_{55}H_{116}N_8O_2.6CF_3CO_2H$, $C_{49}H_{102}N_6O_3.4CF_3CO_2H$, $C_{44}H_{89}N_5O_3.2CF_3CO_2H$, $C_{100}H_{206}N_{12}O_4S_2.8CF_3CO_2H$, $C_{41}H_{78}NO_8P$) $C_{162}H_{330}N_{22}O_9.13CF_3CO_2H$, $C_{43}H_{88}N_4O_2.2CF_3CO_2H$, $C_{43}H_{88}N_4O_3.2CF_3CO_2H$, and (1-methyl-4-(1-octadec-9-enyl-nonadec-10-enylenyl) pyridinium chloride.

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15. The method of claim 1, wherein a delivery agent is energy.

16. The method of claim 15, wherein the cell is treated with energy.

17. The method of claim 15, wherein the energy is ultrasound energy.

18. The method of claim 17, wherein the ultrasound energy is applied to the cell for about 30 seconds to about 5 minutes.

19. The method of claim 17, wherein the ultrasound energy is applied as one continuous pulse.

20. The method of claim 17, wherein the ultrasound energy is applied as two or more intermittent pulses.

21. The method of claim 20, wherein the intermittent pulses of the ultrasound energy are applied for substantially the same length of time, at substantially the same energy level.

22. The method of claim 20, wherein the intermittent pulses vary in energy level, the length of time applied, or energy level and the length of time applied.

23. The method of claim 11, wherein prior to applying the ultrasound energy to the cell, the cell is contacted with a cavitation compound.

24. The method of claim 17, wherein prior to applying the ultrasound energy to the cell, the cell is contacted with a cavitation compound

25. The method of claim 11, wherein the agent that enhances permeability comprises applying electrical energy.

26. The method of claim 1 that comprises:

(a) applying ultrasound or electrical energy to the cell; and

(b) contacting the cell, upon conclusion of the application of ultrasound or electrical energy, with a mixture of the nucleic acid molecule and a delivery agent, whereby the nucleic acid molecule is delivered into the cell.

27. The method of claim 26, wherein the agent is a cationic compound.

28. The method of claim 25, wherein the energy is ultrasound.

29. The method of claim 28, wherein prior to applying the ultrasound energy, the cell is contacted with a cavitation compound.

30. The method of claim 1 wherein the cell is a plant cell or an animal cell.

31. The method of claim 1, wherein the cell is selected from the group consisting of a nuclear transfer donor cell, a stem cell,a primary cell, a cell from an immortalized cell line and a cell capable of the generation of a specific organ.

32. The method of claim 1, wherein the cell is selected from the group consisting of a primary cell, an immortalized cell, an embryonic cell, a stem cell, a transformed cell and a tumor cell.

33. The method of claim 1, wherein the cell is selected from the group consisting of a nuclear transfer donor cell, a stem cell, and a cell capable of the generation of a specific organ.

34. A method for delivering a nucleic acid molecule into a cell comprising:

(a) contacting the cell in the absence of the nucleic acid molecule with a delivery agent, and applying ultrasound energy or electrical energy to the cell, wherein the contacting and applying are performed sequentially or simultaneously; and then

(b) contacting the cell with the nucleic acid molecule, whereby the nucleic acid molecule is delivered into the cell.

35. The method of claim 34, wherein the delivery agent comprises a cationic compound.

36. The method of claim 34, wherein the delivery agent is a composition that comprises one or more cationic compounds, wherein the compound is selected from the group consisting of N-[1-(2,3-dioleyloxy)-propyl]-N,N,N-trimethylammonium chloride (DOTMA), dioleoyl-

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phosphatidylethanolamine (DOPE), 2,3-dioleyloxy-N-[2(spermine-carboxamido)ethyl]-N,N-dimethyl-1-propanaminiumtrifluoroacetate (DOSPA), dioleoyl phosphatidylethanolamine (DOPE), $C_{52}H_{106}N_6O_4 \cdot 4CF_3CO_2H$, $C_{88}H_{178}N_8O_4S_2 \cdot 4CF_3CO_2H$, $C_{40}H_{84}NO_3P \cdot CF_3CO_2H$, $C_{50}H_{103}N_7O_3 \cdot 4CF_3CO_2H$, $C_{55}H_{116}N_8O_2 \cdot 6CF_3CO_2H$, $C_{49}H_{102}N_6O_3 \cdot 4CF_3CO_2H$, $C_{44}H_{89}N_5O_3 \cdot 2CF_3CO_2H$, $C_{100}H_{206}N_{12}O_4S_2 \cdot 8CF_3CO_2H$, $C_{41}H_{78}NO_8P$), $C_{162}H_{330}N_{22}O_9 \cdot 13CF_3CO_2H$, $C_{43}H_{88}N_4O_2 \cdot 2CF_3CO_2H$, $C_{43}H_{88}N_4O_3 \cdot 2CF_3CO_2H$, and (1-methyl-4-(1-octadec-9-enyl-nonadec-10-enylenyl) pyridinium chloride.

37. The method of claim 34, wherein the delivery agent is 1-methyl-4-(1-octadec-9-enyl-nonadec-10-enylenyl) pyridinium chloride.

38. The method of claim 34, wherein the nucleic acid molecule is greater than about 1 megabase.

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39. The method of claim 34, wherein the nucleic acid molecule is selected from the group consisting of an artificial chromosome, a artificial chromosome expression system (Aces) and a natural chromosome or a fragment thereof that is greater than at least about 0.6 megabase.

40. The method of claim 35, wherein the cationic compound is selected from the group consisting of a cationic lipid, a cationic polymer, a mixture of cationic lipids, a mixture of cationic polymers, a mixture of a cationic lipid and a cationic polymer, a mixture of a cationic lipid and a neutral lipid, polycationic lipids, non-liposomal forming lipids, activated dendrimers and a pyridinium chloride surfactant.

41. The method of claim 34, wherein the energy is ultrasound.

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42. The method of claim 41, wherein the ultrasound energy is applied to the cell at between about 0.1 and 1 watts/cm^2, for about 30 seconds to about 5 minutes.

43. The method of claim 41, wherein the ultrasound energy is applied as one continuous pulse or as two or more intermittent pulses.

44. The method of claim 43, wherein:

the pulses are intermittent pulses; and

the intermittent pulses of the ultrasound energy are applied for substantially the same length of time, at substantially the same energy level.

45. The method of claim 43, wherein:

the pulses are intermittent pulses; and

the intermittent pulses vary in energy level, the length of time applied, or energy level and the length of time applied.

46. The method of claim 34, wherein prior to applying the ultrasound energy, the cell is contacted with a cavitation compound.

47. The method of claim 34, wherein the cell is selected from the group consisting of an embryonic stem cell, a nuclear transfer donor cell, a stem cell and a cell capable of the generation of a specific organ.

48. A method for delivering nucleic acid molecule into a cell in a subject comprising:

(a) administering a delivery agent to the subject in the absence of the nucleic acid molecule;

(b) applying ultrasound or electrical energy to the subject after administering the agent; and

(c) administering nucleic acid molecule to the subject upon completion of the application of ultrasound or electrical energy, whereby the nucleic acid molecule is delivered into the cell.

49. The method of claim 48, wherein the agent is a cationic compound.

50. The method of claim 48, wherein administering the cationic compound and the nucleic acid molecule and applying the energy is directly to a localized region of the subject wherein the cell is present.

51. The method of claim 48, wherein the delivery agent is a composition that comprises one or more cationic compounds, wherein the compound is selected from the group consisting of N-[1-(2,3-dioleyloxy)-propyl]-N,N,N-trimethylammonium chloride (DOTMA), dioleoyl-phosphatidylethanolamine (DOPE), 2,3-dioleyloxy-N-[2(spermine-

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carboxamido)ethyl]-N,N-dimethyl-1-propanaminiumtrifluoroacetate (DOSPA), dioleoyl phosphatidylethanolamine (DOPE), $C_{52}H_{106}N_6O_4.4CF_3CO_2H$, $C_{88}H_{178}N_8O_4S_2.4CF_3CO_2H$, $C_{40}H_{84}NO_3P.CF_3CO_2H$, $C_{50}H_{103}N_7O_3.4CF_3CO_2H$, $C_{55}H_{116}N_8O_2.6CF_3CO_2H$, $C_{49}H_{102}N_6O_3.4CF_3CO_2H$, $C_{44}H_{89}N_5O_3.2CF_3CO_2H$, $C_{100}H_{206}N_{12}O_4S_2.8CF_3CO_2H$, $C_{41}H_{78}NO_8P$), $C_{162}H_{330}N_{22}O_9.13CF_3CO_2H$, $C_{43}H_{88}N_4O_2.2CF_3CO_2H$, $C_{43}H_{88}N_4O_3.2CF_3CO_2H$, and (1-methyl-4-(1-octadec-9-enyl-nonadec-10-enylenyl) pyridinium chloride.

52. The method of claim 50, wherein the region of the subject is selected from the group consisting of a joint, a tumor, an organ and a tissue.

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53. The method of claim 48, wherein the nucleic acid molecule is greater than about 1 megabases.

54. The method of claim 48, wherein the nucleic acid molecule is greater than about 5 megabases.

55. The method of claim 48, wherein the nucleic acid molecule is selected from the group consisting of an artificial chromosome, a satellite artificial chromosome and a natural chromosome or a fragment thereof.

56. The method of claim 49, wherein the cationic compound is selected from the group consisting of a cationic lipid, a cationic polymer, a mixture of cationic lipids, a mixture of cationic polymers, a mixture of a cationic lipid and a cationic polymer, a mixture of a cationic lipid and a neutral lipid, polycationic lipids, non-liposomal forming lipids, activated dendrimers and a pyridinium chloride surfactant.

57. The method of claim 48, wherein the energy is ultrasound and prior to administering the ultrasound energy to the subject, the subject is administered a cavitation compound.

58. A method for delivering a large nucleic acid molecule into a cell, comprising:

(a) contacting the nucleic acid molecule with a composition that comprises a cationic lipid; and then

(b) contacting the nucleic acid molecule with a cell, wherein steps (a) and (b) are performed simultaneously or sequentially.

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59. The method of claim 58, wherein the cationic lipid composition comprises 2,3-dioleyloxy-N-[2(spermine-carboxamido)ethyl]-N,N-dimethyl-1-propanaminiumtrifluoroacetate (DOSPA) and dioleoyl phosphatidylethanolamine (DOPE).

60. The method of claim 58, wherein the nucleic acid is molecule is greater than 0.6 megabase pairs in size.

61. The method of claim 58, wherein the nucleic acid molecule is a natural chromosome, an artificial chromosome, a fragment of a chromosome, or naked DNA.

62. The method of claim 58, wherein the cell is selected from the group consisting of a plant cell and an animal cell.

63. The method of claim 58, wherein the cell is selected from the group consisting of a primary cell, an immortalized cell, an embryonic cell, a stem cell, a transformed cell and a tumor cell.

64. The method of claim 58, wherein the nucleic acid molecule is contacted with the cell *in vitro*, *ex vivo* or *in vivo*.

65. A method for delivering nucleic acid molecule into a cell in a subject comprising:

(a) mixing nucleic acid molecule with a delivery agent; and

(b) administering the mixture of nucleic acid molecule and agent to the subject, whereby the nucleic acid molecule is delivered into the cell to a greater extent than using the agent or energy alone.

66. The method of claim 65, wherein the agent is a cationic compound.

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67. The method of claim 66, wherein the cationic compound and the nucleic acid molecule mixture is applied locally.

68. The method of claim 67, wherein the mixture is applied to a joint, a tumor, an organ or a tissue.

69. The method of claim 65, wherein the nucleic acid molecule is greater than about 1 megabase.

70. The method of claim 66, wherein the cationic compound is selected from the group consisting of a cationic lipid, a cationic polymer, a mixture of cationic lipids, a mixture of cationic polymers, a mixture of a cationic lipid and a cationic polymer, a mixture of a cationic lipid and a neutral lipid, polycationic lipids, non-liposomal forming lipids, activated dendrimers, and a pyridinium chloride surfactant.

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71. The method of claim 65, wherein the nucleic acid molecule is selected from the group consisting of an artificial chromosome, a artificial chromosome expression system (Aces), a natural chromosome or a fragment thereof that is greater than at least about 0.6 megabase.

72. The method of claim 65, wherein the nucleic acid molecule is a natural chromosome, an artificial chromosome, a fragment of a chromosome or naked DNA that is greater than at least about 0.6 megabase in size.

73. A method for delivering nucleic acid molecule into a cell in a subject comprising:

(a) applying ultrasound or electrical energy to subject; and

(b) administering to the subject a nucleic acid molecule and a delivery agent, upon conclusion of the application of ultrasound or electrical energy, whereby the nucleic acid molecule is delivered into the cell, wherein the delivery agent and nucleic acid are administered sequentially or as a single composition.

74. The method of claim 73, wherein the delivery agent is administered, upon conclusion of the application of ultrasound or electrical energy followed by administration of the nucleic acid molecule, whereby the nucleic acid molecule is delivered into a cell.

75. The method of claim 73, wherein prior to applying the ultrasound energy, the subject is administered a cavitation compound.

76. The method of claim 75, wherein the energy is ultrasound and prior to applying the ultrasound energy, the subject is administered a cavitation compound.

77. The method of claim 63, wherein the agent is a cationic compound.

78. The method of claim 77, wherein the cationic compound is selected from the group consisting of a cationic lipid, a cationic polymer, a mixture of cationic lipids, a mixture of cationic polymers, a mixture of a cationic lipid and a cationic polymer, a mixture of a cationic lipid and a neutral lipid, polycationic lipids, non-liposomal forming lipids, activated dendrimers, and a pyridinium chloride surfactant.

79. The method of claim 73, wherein the delivery agent is a composition that comprises one or more cationic compounds, wherein the compound is selected from the group consisting of N-[1-(2,3-dioleyloxy)-propyl]-N,N,N-trimethylammonium chloride (DOTMA), dioleoyl-phosphatidylethanolamine (DOPE), 2,3-dioleyloxy-N-[2(spermine-carboxamido)ethyl]-N,N-dimethyl-1-propanaminiumtrifluoroacetate (DOSPA), dioleoyl phosphatidylethanolamine (DOPE), $C_{52}H_{106}N_6O_4.4CF_3CO_2H$, $C_{88}H_{178}N_8O_4S_2.4CF_3CO_2H$, $C_{40}H_{84}NO_3P.CF_3CO_2H$, $C_{50}H_{103}N_7O_3.4CF_3CO_2H$, $C_{55}H_{116}N_8O_2.6CF_3CO_2H$, $C_{49}H_{102}N_6O_3.4CF_3CO_2H$, $C_{44}H_{89}N_5O_3.2CF_3CO_2H$, $C_{100}H_{206}N_{12}O_4S_2.8CF_3CO_2H$, $C_{41}H_{78}NO_8P$), $C_{162}H_{330}N_{22}O_9.13CF_3CO_2H$, $C_{43}H_{88}N_4O_2.2CF_3CO_2H$, $C_{43}H_{88}N_4O_3.2CF_3CO_2H$, and (1-methyl-4-(1-octadec-9-enyl-nonadec-10-enylenyl) pyridinium chloride.

80. A method for delivering nucleic acid molecule into a cell in a subject comprising:

(a) applying ultrasound or electrical energy to the subject; and

(b) administering to the subject the nucleic acid molecule upon conclusion of the application of ultrasound or electrical energy, whereby the nucleic acid molecule is delivered into the cell.

81. The method of claim 80, wherein the energy is ultrasound and prior to applying the ultrasound energy, the subject is administered a cavitation compound.

82. The method of claim 80, wherein the agent comprises a cationic compound.

83. The method of claim 80, wherein the nucleic acid molecule is a natural chromosome, an artificial chromosome, a fragment of a chromosome or naked DNA that is greater than at least about 0.6 megabase in size.

84. A method for *ex vivo* gene therapy, comprising:

(a) delivering *in vitro* a nucleic acid molecule into a cell by contacting the cell in the absence of the nucleic acid molecule with a composition comprising a compound that delivers nucleic acid molecule into cells;

(b) applying ultrasound or electrical energy to the cell first contacted with the compound;

(c) contacting the cell with the nucleic acid molecule upon conclusion of the application of ultrasound or electrical energy, whereby the nucleic acid molecule is delivered into the cell; and

(d) introducing the cell into a subject.

85. The method of claim 84, wherein the compound is a cationic compound.

86. The method of claim 84, wherein the cationic compound is selected from the group consisting of a cationic lipid, a cationic polymer, a mixture of cationic lipids, a mixture of cationic polymers, a mixture of a cationic lipid and a cationic polymer, a mixture of a cationic lipid and a neutral lipid, polycationic lipids, non-liposomal forming lipids, activated dendrimers, and a pyridinium chloride surfactant.

87. The method of claim 85, wherein the compound is selected from the group consisting of N-[1-(2,3-dioleyloxy)propyl]-N,N,N-trimethyl-ammonium chloride (DOTMA), dioleoylphosphatidylethanolamine (DOPE),

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2,3-dioleyloxy-N-[2(spermine-carboxamido)ethyl]-N,N-dimethyl-1-propan-aminiumtrifluoroacetate (DOSPA), dioleoyl phosphatidylethanolamine (DOPE), $C_{52}H_{106}N_6O_4.4CF_3CO_2H$, $C_{88}H_{178}N_8O_4S_2.4CF_3CO_2H$, $C_{40}H_{84}NO_3P.CF_3CO_2H$, $C_{50}H_{103}N_7O_3.4CF_3CO_2H$, $C_{55}H_{116}N_8O_2.6CF_3CO_2H$, $C_{49}H_{102}N_6O_3.4CF_3CO_2H$, $C_{44}H_{89}N_5O_3.2CF_3CO_2H$, $C_{41}H_{78}NO_8P$), $C_{100}H_{206}N_{12}O_4S_2.8CF_3CO_2H$, $C_{162}H_{330}N_{22}O_9.13CF_3CO_2H$, $C_{43}H_{88}N_4O_2.2CF_3CO_2H$, $C_{43}H_{88}N_4O_3.2CF_3CO_2H$ and (1-methyl-4-(1-octadec-9-enyl-nonadec-10-enylenyl) pyridinium chloride.

88. The method of claim 84, wherein the nucleic acid molecule is a natural chromosome, an artificial chromosome, a fragment of a chromosome or naked DNA that is greater than at least about 0.6 megabase in size.

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89. The method of claim 84, wherein the plant is a plant cell or an animal cell.

90. The method of claim 84, wherein the cell is selected from the group consisting of a nuclear transfer donor cell, a stem cell, a primary cell, an immortalized cell line, and a cell capable of the generation of a specific organ.

91. The method of claim 84, wherein the cell is selected from the group consisting of an immortalized cell, an embryonic cell, a stem cell, a transformed cell and a tumor cell.

92. A method for *ex vivo* gene therapy, comprising:

(a) delivering, *in vitro*, nucleic acid molecule into a cell by contacting the cell with the nucleic acid molecule mixed with a composition that comprises a compound that delivers nucleic acid molecule into cells;

(b) applying ultrasound or electrical energy to the cell contacted with the nucleic acid molecule and the compound, whereby the nucleic acid molecule is delivered into the cell to a greater extent than in the presence of the compound alone; and

(c) introducing the cell into a subject.

93. The method of claim 92, wherein the compound is selected from the group consisting of a cationic lipid, a cationic polymer, a mixture of cationic lipids, a mixture of cationic polymers, a mixture of a cationic lipid and a cationic polymer, a mixture of a cationic lipid and a neutral lipid, polycationic lipids, non-liposomal forming lipids, activated dendrimers, and a pyridinium chloride surfactant.

94. The method of claim 92, wherein the compound is selected from the group consisting of N-[1-(2,3-dioleyloxy)propyl]-N,N,N-trimethyl-ammonium chloride (DOTMA), dioleoylphosphatidylethanolamine (DOPE), 2,3-dioleyloxy-N-[2(spermine-carboxamido)ethyl]-N,N-dimethyl-1-propan-aminiumtrifluoroacetate (DOSPA), dioleoyl phosphatidylethanolamine (DOPE), $C_{52}H_{106}N_6O_4 \cdot 4CF_3CO_2H$, $C_{88}H_{178}N_8O_4S_2.4CF_3CO_2H$, $C_{40}H_{84}NO_3P.CF_3CO_2H$, $C_{50}H_{103}N_7O_3.4CF_3CO_2H$, $C_{55}H_{116}N_8O_2.6CF_3CO_2H$, $C_{49}H_{102}N_6O_3.4CF_3CO_2H$, $C_{44}H_{89}N_5O_3.2CF_3CO_2H$, $C_{41}H_{78}NO_8P$), $C_{100}H_{206}N_{12}O_4S_2.8CF_3CO_2H$, $C_{162}H_{330}N_{22}O_9.13CF_3CO_2H$, $C_{43}H_{88}N_4O_2.2CF_3CO_2H$, $C_{43}H_{88}N_4O_3.2CF_3CO_2H$ and (1-methyl-4-(1-octadec-9-enyl-nonadec-10-enylenyl) pyridinium chloride.

95. The method of claim 92, wherein the nucleic acid molecule is a natural chromosome, an artificial chromosome, a fragment of a chromosome or naked DNA that is greater than at least about 0.6 megabase in size.

96. The method of claim 92, wherein the plant is a plant cell or an animal cell.

97. The method of claim 92, wherein the cell is selected from the group consisting of a nuclear transfer donor cell, a stem cell, a primary cell, an immortalized cell, and a cell capable of the generation of a specific organ.

98. The method of claim 92, wherein the cell is selected from the group consisting of an embryonic cell, a stem cell, a transformed cell and a tumor cell.

99. The method of claim 92, wherein the energy is ultrasound and prior to applying ultrasound to the cell, the cell is contacted with a cavitation compound.

100. A method for *ex vivo* gene therapy, comprising:

(a) contacting, *in vitro*, a cell in the absence of nucleic acid molecule with a composition that comprises a compound that delivers nucleic acid molecule to a cell;

(b) contacting the cell previously contacted with the compound with nucleic acid molecule;

(c) applying ultrasound or electrical energy to the cell contacted with the compound and nucleic acid molecule, whereby the nucleic acid molecule is delivered into the cell to a greater extent then in the presence of the compound alone; and

(d) introducing the cell into a subject.

101. The method of claim 100, wherein the compound is selected from the group consisting of a cationic lipid, a cationic polymer, a mixture of cationic lipids, a mixture of cationic polymers, a mixture of a cationic lipid and a cationic polymer, a mixture of a cationic lipid and a neutral lipid, polycationic lipids, non-liposomal forming lipids, activated dendrimers, and a pyridinium chloride surfactant.

102. The method of claim 100, wherein the compound is selected from the group consisting of N-[1-(2,3-dioleyloxy)propyl]-N,N,N-trimethyl-ammonium chloride (DOTMA), dioleoylphosphatidylethanolamine (DOPE), 2,3-dioleyloxy-N-[2(spermine-carboxamido)ethyl]-N,N-dimethyl-1-propan-aminiumtrifluoroacetate (DOSPA), dioleoyl phosphatidylethanolamine (DOPE), $C_{52}H_{106}N_6O_4{\cdot}4CF_3CO_2H$, $C_{88}H_{178}N_8O_4S_2{\cdot}4CF_3CO_2H$, $C_{40}H_{84}NO_3P{\cdot}CF_3CO_2H$, $C_{50}H_{103}N_7O_3{\cdot}4CF_3CO_2H$, $C_{55}H_{116}N_8O_2{\cdot}6CF_3CO_2H$, $C_{49}H_{102}N_6O_3{\cdot}4CF_3CO_2H$, $C_{44}H_{89}N_5O_3{\cdot}2CF_3CO_2H$, $C_{41}H_{78}NO_8P$), $C_{100}H_{206}N_{12}O_4S_2{\cdot}8CF_3CO_2H$, $C_{162}H_{330}N_{22}O_9{\cdot}13CF_3CO_2H$, $C_{43}H_{88}N_4O_2{\cdot}2CF_3CO_2H$, $C_{43}H_{88}N_4O_3{\cdot}2CF_3CO_2H$ and (1-methyl-4-(1-octadec-9-enyl-nonadec-10-enylenyl) pyridinium chloride.

103. The method of claim 100, wherein the nucleic acid molecule is a natural chromosome, an artificial chromosome, a fragment of a chromosome or naked DNA that is greater than at least about 0.6 megabase in size.

104. The method of claim 100, wherein the plant is a plant cell or an animal cell.

105. The method of claim 100, wherein the cell is selected from the group consisting of a nuclear transfer donor cell, a stem cell, primary cells, an immortalized cell, and a cell capable of the generation of a specific organ.

106. The method of claim 100, wherein the cell is selected from the group consisting of an embryonic cell, a transformed cell and a tumor cell.

107. The method of claim 100, wherein the energy is ultrasound and prior to applying ultrasound to the cell, the cell is contacted with a cavitation compound.

108. A method for *ex vivo* gene therapy, comprising:

(a) applying, *in vitro*, ultrasound or electrical energy to the cell;

(b) contacting the cell with a mixture of nucleic acid molecule and a composition that comprises a compound that delivers nucleic acid molecule to a cell, upon conclusion of the application of ultrasound or energy, whereby the nucleic acid molecule is delivered into the cell; and

(c) introducing the cell into a subject.

109. The method of claim 108, wherein the compound is selected from the group consisting of a cationic lipid, a cationic polymer, a mixture of cationic lipids, a mixture of cationic polymers, a mixture of a cationic lipid and a cationic polymer, a mixture of a cationic lipid and a neutral lipid, polycationic lipids, non-liposomal forming lipids, activated dendrimers, and a pyridinium chloride surfactant.

110. The method of claim 108, wherein the compound is selected from the group consisting of N-[1-(2,3-dioleyloxy)propyl]-N,N,N-trimethyl-

ammonium chloride (DOTMA), dioleoylphosphatidylethanolamine (DOPE), 2,3-dioleyloxy-N-[2(spermine-carboxamido)ethyl]-N,N-dimethyl-1-propan-aminiumtrifluoroacetate (DOSPA), dioleoyl phosphatidylethanolamine (DOPE), $C_{52}H_{106}N_6O_4.4CF_3CO_2H$, $C_{88}H_{178}N_8O_4S_2.4CF_3CO_2H$, $C_{40}H_{84}NO_3P.CF_3CO_2H$, $C_{50}H_{103}N_7O_3.4CF_3CO_2H$, $C_{55}H_{116}N_8O_2.6CF_3CO_2H$, $C_{49}H_{102}N_6O_3.4CF_3CO_2H$, $C_{44}H_{89}N_5O_3.2CF_3CO_2H$, $C_{41}H_{78}NO_8P$), $C_{100}H_{206}N_{12}O_4S_2.8CF_3CO_2H$, $C_{162}H_{330}N_{22}O_9.13CF_3CO_2H$, $C_{43}H_{88}N_4O_2.2CF_3CO_2H$, $C_{43}H_{88}N_4O_3.2CF_3CO_2H$ and (1-methyl-4-(1-octadec-9-enyl-nonadec-10-enylenyl) pyridinium chloride.

111. The method of claim 108, wherein the nucleic acid molecule is a natural chromosome, an artificial chromosome, a fragment of a chromosome or naked DNA that is greater than at least about 0.6 megabase in size.

112. The method of claim 108, wherein the plant is a plant cell or an animal cell.

113. The method of claim 108, wherein the cell is selected from the group consisting of a nuclear transfer donor cell, a stem cell, a primary cell, an immortalized cell, and a cell capable of the generation of a specific organ.

114. The method of claim 108, wherein the cell is selected from the group consisting of an embryonic cell, a transformed cell and a tumor cell.

115. The method of claim 108, wherein the energy is ultrasound and prior to applying ultrasound to the cell, the cell is contacted with a cavitation compound.

116. A method for *ex vivo* gene therapy, comprising:

(a) applying, *in vitro* ultrasound or electrical energy to a cell;

(b) contacting the cell with a composition that comprises a composition comprising at least one compound that delivers nucleic acid molecule into a cell, upon conclusion of the application of ultrasound or electrical energy; and

(c) contacting the cell previously contacted with the compound with nucleic acid molecule, whereby the nucleic acid molecule is delivered into the cell; and

(d) introducing the cell into a subject.

117. The method of claim 116, wherein the compound is selected from the group consisting of a cationic lipid, a cationic polymer, a mixture of cationic lipids, a mixture of cationic polymers, a mixture of a cationic lipid and a cationic polymer, a mixture of a cationic lipid and a neutral lipid, polycationic lipids, non-liposomal forming lipids, activated dendrimers, and a pyridinium chloride surfactant.

118. The method of claim 116, wherein the compound is selected from the group consisting of N-[1-(2,3-dioleyloxy)propyl]-N,N,N-trimethyl-ammonium chloride (DOTMA), dioleoylphosphatidylethanolamine (DOPE), 2,3-dioleyloxy-N-[2(spermine-carboxamido)ethyl]-N,N-dimethyl-1-propan-aminiumtrifluoroacetate (DOSPA), dioleoyl phosphatidylethanolamine (DOPE), $C_{52}H_{106}N_6O_4 \cdot 4CF_3CO_2H$, $C_{88}H_{178}N_8O_4S_2.4CF_3CO_2H$, $C_{40}H_{84}NO_3P.CF_3CO_2H$, $C_{50}H_{103}N_7O_3.4CF_3CO_2H$, $C_{55}H_{116}N_8O_2.6CF_3CO_2H$, $C_{49}H_{102}N_6O_3.4CF_3CO_2H$, $C_{44}H_{89}N_5O_3.2CF_3CO_2H$, $C_{41}H_{78}NO_8P$), $C_{100}H_{206}N_{12}O_4S_2.8CF_3CO_2H$, $C_{162}H_{330}N_{22}O_9.13CF_3CO_2H$, $C_{43}H_{88}N_4O_2.2CF_3CO_2H$, $C_{43}H_{88}N_4O_3.2CF_3CO_2H$ and (1-methyl-4-(1-octadec-9-enyl-nonadec-10-enylenyl) pyridinium chloride.

119. The method of claim 116, wherein the nucleic acid molecule is a natural chromosome, an artificial chromosome, a fragment of a chromosome or naked DNA that is greater than at least about 0.6 megabase in size.

120. The method of claim 116, wherein the plant is a plant cell or an animal cell.

121. The method of claim 116, wherein the cell is selected from the group consisting of a nuclear transfer donor cell, a stem cell, a primary cell, an immortalized cell, and a cell capable of the generation of a specific organ.

122. The method of claim 116, wherein the cell is selected from the group consisting of an embryonic cell, a transformed cell and a tumor cell.

123. The method of claim 116, wherein the energy is ultrasound and prior to applying ultrasound to the cell, the cell is contacted with a cavitation compound.

124. A method for *ex vivo* gene therapy, comprising:

(a) contacting, *in vitro* a cell with nucleic acid molecule;

(b) applying ultrasound or electrical energy to the cell contacted with nucleic acid molecule, whereby the nucleic acid molecule is delivered into the cell; and

(c) introducing the cell into a subject.

125. The method of claim 124, wherein the energy is ultrasound and prior to applying the ultrasound energy, the cell is contacted with a cavitation compound.

126. The method of claim 124, wherein the nucleic acid molecule is a natural chromosome, an artificial chromosome, a fragment of a chromosome or naked DNA that is greater than at least about 0.6 megabase in size.

127. The method of claim 124, wherein the plant is a plant cell or an animal cell.

128. The method of claim 124, wherein the cell is selected from the group consisting of a nuclear transfer donor cell, a stem cell, a primary cell, an immortalized cell, and a cell capable of the generation of a specific organ.

129. The method of claim 124, wherein the cell is selected from the group consisting of an embryonic cell, a transformed cell and a tumor cell.

130. The method of claim 124, wherein the energy is ultrasound and prior to applying ultrasound to the cell, the cell is contacted with a cavitation compound.

131. A method for *ex vivo* gene therapy, comprising:

(a) applying, *in vitro*, ultrasound or electrical energy to the cell;

(b) contacting the cell with a nucleic acid molecule upon conclusion of the application of ultrasound or electrical energy, whereby the nucleic acid molecule is delivered into the cell;

(c) introducing the cell into a subject.

132. The method of claim 131, wherein the nucleic acid molecule is a natural chromosome, an artificial chromosome, a fragment of a chromosome or naked DNA that is greater than at least about 0.6 megabase in size.

133. The method of claim 131, wherein the plant is a plant cell or an animal cell.

134. The method of claim 131, wherein the cell is selected from the group consisting of a nuclear transfer donor cell, a stem cell, a primary cell, an immortalized cell, and a cell capable of the generation of a specific organ.

135. The method of claim 131, wherein the cell is selected from the group consisting of an embryonic cell, a transformed cell and a tumor cell.

136. The method of claim 131, wherein the energy is ultrasound and prior to applying the ultrasound energy, the cell is contacted with a cavitation compound.

137. The method of claim 131, wherein the compound is selected from the group consisting of a cationic lipid, a cationic polymer, a mixture of cationic lipids, a mixture of cationic polymers, a mixture of a cationic lipid and a cationic polymer, a mixture of a cationic lipid and a neutral lipid, polycationic lipids, non-liposomal forming lipids, activated dendrimers, and a pyridinium chloride surfactant.

138. The method of claim 131, wherein the compound is selected from the group consisting of N-[1-(2,3-dioleyloxy)propyl]-N,N,N-trimethyl-ammonium chloride (DOTMA), dioleoylphosphatidylethanolamine (DOPE),

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2,3-dioleyloxy-N-[2(spermine-carboxamido)ethyl]-N,N-dimethyl-1-propan-aminiumtrifluoroacetate (DOSPA), dioleoyl phosphatidylethanolamine (DOPE), $C_{52}H_{106}N_6O_4 \cdot 4CF_3CO_2H$, $C_{88}H_{178}N_8O_4S_2.4CF_3CO_2H$, $C_{40}H_{84}NO_3P.CF_3CO_2H$, $C_{50}H_{103}N_7O_3.4CF_3CO_2H$, $C_{55}H_{116}N_8O_2.6CF_3CO_2H$, $C_{49}H_{102}N_6O_3.4CF_3CO_2H$, $C_{44}H_{89}N_5O_3.2CF_3CO_2H$, $C_{41}H_{78}NO_8P$), $C_{100}H_{206}N_{12}O_4S_2.8CF_3CO_2H$, $C_{162}H_{330}N_{22}O_9.13CF_3CO_2H$, $C_{43}H_{88}N_4O_2.2CF_3CO_2H$, $C_{43}H_{88}N_4O_3.2CF_3CO_2H$ and (1-methyl-4-(1-octadec-9-enyl-nonadec-10-enylenyl) pyridinium chloride.

139. The method of claim 131, wherein the energy is ultrasound and prior to applying ultrasound to the cell, the cell is contacted with a cavitation compound.

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140. A kit for delivering nucleic acids into cells, comprising:

a delivery agent that comprises a composition comprising a delivery agent;

reagents for performing sonorporation or electroporation; and

optionally instructions for delivering nucleic acids into cells.

141. The kit of claim 140, further comprising a compositions comprising an artificial chromosome.

142. The kit of claim 141, wherein the delivery agent comprises a compound is selected from the group consisting of a cationic lipid, a cationic polymer, a mixture of cationic lipids, a mixture of cationic polymers, a mixture of a cationic lipid and a cationic polymer, a mixture of a cationic lipid and a neutral lipid, polycationic lipids, non-liposomal forming lipids, activated dendrimers, and a pyridinium chloride surfactant.

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143. The kit of claim 142, wherein the compound is selected from the group consisting of N-[1-(2,3-dioleyloxy)propyl]-N,N,N-trimethyl-ammonium chloride (DOTMA), dioleoylphosphatidylethanolamine (DOPE), 2,3-dioleyloxy-N-[2(spermine-carboxamido)ethyl]-N,N-dimethyl-1-propan-aminiumtrifluoroacetate (DOSPA), dioleoyl phosphatidylethanolamine (DOPE), $C_{52}H_{106}N_6O_4 \cdot 4CF_3CO_2H$, $C_{88}H_{178}N_8O_4S_2.4CF_3CO_2H$, $C_{40}H_{84}NO_3P.CF_3CO_2H$, $C_{50}H_{103}N_7O_3.4CF_3CO_2H$, $C_{55}H_{116}N_8O_2.6CF_3CO_2H$,

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$C_{49}H_{102}N_6O_3.4CF_3CO_2H$, $C_{44}H_{89}N_5O_3.2CF_3CO_2H$, $C_{41}H_{78}NO_8P$), $C_{100}H_{206}N_{12}O_4S_2.8CF_3CO_2H$, $C_{162}H_{330}N_{22}O_9.13CF_3CO_2H$, $C_{43}H_{88}N_4O_2.2CF_3CO_2H$, $C_{43}H_{88}N_4O_3.2CF_3CO_2H$ and (1-methyl-4-(1-octadec-9-enyl-nonadec-10-enylenyl) pyridinium chloride.